

1/7

mkrm1	~ ~ ~ ~ ~ ~ ~ ~ ~ ~	T G G G G G G G G G	G G G G G G G G G G	G G G G G G G G G G	C . . T C G G G G G	29
hkrm1	~ ~ ~ ~ ~ ~ ~ ~ ~ ~	T G G G G G G G G G	G G G G G G G G G G	G G G G G G G G G G	C . . T C G G G G G	29
mkrm2	A T G G G G A C A C	C A C A T C T G C A	G G G G G G G G G G	G G G G G G G G G G	. . . C T C G G G G	37
hkrm2	A T G G G G A C A C	A A G C C C G T G C A	G G G G G G G G G G	G G G G G G G G G G	T T T C T C G G G G	40
mkrm1	G C T C T C G G G C	G C T G G G G G T C A	C T C T G G	C G G C C G G G G C	65	
hkrm1	G C T C T C G G G C	G C T G G G G G T C A	C G C T G G	C G G C C G G G G C	65	
mkrm2	T C C C A T T T G G	G C T G G G G G T C G	C A G G G G G G C C T	C A G C C G G G G C	77	
hkrm2	T C T C C C G G G T	G C T G G G G G C C G	C G T G G G G G C C T	C G G C C G G G A G	80	
mkrm1	G G G G G C G G G T	C C G G G G T C C G	G C C C G A G T G	C T T C A C A G C C	105	
hkrm1	G G G G G C T A G C	C C G G G G T C C G	G C C C G A G T G	T T T C A C A G C C	105	
mkrm2	T C C C A T T T G G	C C A G G G T T G	. . T C C G A T G	C T T C A C A G T G	114	
hkrm2	C C T G G G A G T	C C A G G C T G	. . T C C G A T G	C T T C A C A G T G	117	
mkrm1	A A C G G T G C A G	A T T A C A G G G G	A A C A C A G A G C	T G G A C A G C C C	145	
hkrm1	A A T G G T G C A G	A T T A T A G G G G	A A C A C A G A A C	T G G A C A G C A C	145	
mkrm2	A A C G G T G C A G	A C T A C C G A G G	C C A C C A G A A C	T A G A C A G C C C	154	
hkrm2	A A T G G T G C A G	A C T A C C G A G G	C C A C C A G A A C	C G G A C A G C C C	157	
mkrm1	T G C A . A G G . .	T G G G A A G C C A	T G T C T G T T C T	G G A A C G A G A C	182	
hkrm1	T A C A . A G G . .	G G G G A A G C C A	T G T C T G T T C T	G G A A C G A G A C	182	
mkrm2	C A C G G G A G G C	T G G A C G C C C T	T G T C T G T T C T	G G G A C C A G A C	194	
hkrm2	C C G C G G G G G C	G G G C C G C C C G	T G C T G T T C T	G G G A C C A G A C	197	
mkrm1	T T T C C A G C A T	C C G T A C A A C A	C G C T G A A G T A	C C C C A A C G G G	222	
hkrm1	T T T C C A G C A T	C C A T A C A A C A	C T C T G A A A T A	C C C C A A C G G G	222	
mkrm2	A C A G C A G C A C	A G C T A C A G C A	G C G C C A G C G A	C C C C A A G G G C	234	
hkrm2	G C A G C A G C A C	A G C T A C A G C A	G G G C C A G C G A	C C C C A A G G G C	237	
mkrm1	G A A G G G G G G C	T G G G G G A G C A	C A A T T A T T G C	A G A A A T C C A G	262	
hkrm1	G A G G G G G G G C	T G G G G T G A G C A	C A A A T T A T T G C	A G A A A T C C A G	262	
mkrm2	C G C T G G G G G T	T G G G G T G G G C A	T A A C T T C T G T	A G G A A C C C A G	274	
hkrm2	C G C T G G G G G C	T G G G G T G G G C A	C A A C T T C T G T	C G T A A C C C A G	277	
mkrm1	A T T G G A G A G G T	G A G C C C T T G G	T G C T A C G T G G	C C G A G C A T G A	302	
hkrm1	A T T G G A G A G G T	G A G C C C C T T G G	T G C T A C G T G G	C A G A G C A C G A	302	
mkrm2	A C G G T G A T G T	G C A G C C C T G G	T G C T A C G T G G	C A G A G C A C A G A	314	
hkrm2	A C G G T G A T G T	G C A G C C C T G G	T G C T A C G T G G	C T G A G A C A G A	317	
mkrm1	G G A C G G G T C	T A C T G G A A G T	A C T G T G A A A T	T C C T G C T T G C	342	
hkrm1	G G A T G G T G T C	T A C T G G A A G T	A C T G T G A A A T	A C C T G C T T G C	342	
mkrm2	A G A G G G C A T C	T A C T G G G G T	A C T G T G A T A T	C C C C A C A T G T	354	
hkrm2	G G A G G G C A T C	T A C T G G G C G T	A C T G G G A C A T	C C C C T C C T G T	357	
mkrm1	C A G A T G C C T G	G A A A C C C T T G G	C T G C T A C A A G	G A T C A T G G A A	382	
hkrm1	C A G A T G C C T G	G A A A C C C T T G G	C T G C T A C A A G	G A T C A T G G A A	382	
mkrm2	C A C A T G C C T G	G G T A C C C T G G	C T G C T T C G T G	G A C T C T G G G G	394	
hkrm2	C A C A T G C C A G	G C T A C C C T G G	A T G C T T T G T G	G A C T C A G G G G	397	
mkrm1	A C C C A C C T C C	T C T C A C G G G C	A C C A G T A A A A	C C T C T A A C A A	422	
hkrm1	A C C C A C C T C C	T C T A A C T G G C	A C C A G T A A A A	C C T C T A A C A A	422	
mkrm2	C A C C G C C C T G	T C T C A A T G G T	C C C A G T G G G A	C C T C T A C A A A	434	
hkrm2	C A C C G C C C A G	C C T C A G C G G C	C C C A G C G G G A	C C T C T A C G A A	437	
mkrm1	G C T C A C C A T A	C A A A C C T G T A	T C A G C T T T T G	T C G G A G T C A G	462	
hkrm1	A C T C A C C A T A	C A A A C C T G C A	T C A G C T T T T G	T C G G A G T C A G	462	
mkrm2	G C T C A C T G T C	C A A G T G T G C C	T T C G A T T T C T	C C G C A T G A A G	474	
hkrm2	G C T C A C G G T C	C A G G T G T G C C	T A G C T T T C T G	C C G C A T G A A G	477	
mkrm1	A G A T T C A A G T	T T G C T G G G A T	G G A G T C A G G C	T A T G C C T G C T	502	
hkrm1	A G G T T C A A G T	T T G C T G G G A T	G G A G T C A G G C	T A T G C C T G C T	502	
mkrm2	G G C T A C C A G C	T T G C C T G G T G T	G G A G G C C T G G T	T A T G C C T G C T	514	
hkrm2	G G G T A C C A G C	T T G C C G G G C G T	G G A G G C C G G T	T A G G C C T G C T	517	
mkrm1	T C T G T G G G A A	C A A T C C T G A T	T A C T G G A A G C	A C G G G G A G G C	542	
hkrm1	T C T G T G G G A A	C A A T C C T G A T	T A C T G G A A G T	A C G G G G A G G C	542	
mkrm2	T C T G T G G G C T	T G A A A G T G A C	C T G G C C G C G	G A C G T C C A G C	554	
hkrm2	T C T G T G G G C T	T G A A A G C G A C	C T G G C C G G G	G A C G C C T G G C	557	
mkrm1	G G C C A G A C C C	G A G T G C A A T A	G T G T C T G C T T	C G G G G A C C A C	582	
hkrm1	A G C C A G T A C C	G A A T G C A A C A	G C G T C T G C T T	C G G G G A C C A C	582	
mkrm2	C C C T G C C A C C	G A C T G T G A C C	A G A T C T G T T T	T G G C C A C C C A	594	
hkrm2	C C C C G C C A C C	G A C T G T G A C C	A G A T C T G T T T	C G G C C A C C C T	597	

Multiple-alignment of mouse and human kremen DNAs (3-1)

Fig. 1 a

2/7

mkrm1	A C G C A G C C C T	G G G G T G G G A G A	G G G C A G G A T T	A T C C C T C T T T G	622
hkrm1	A C G C A G C C C T	G G G G T G G G A G A	T G G C A G G A T T	A T C C C T C T T T G	622
mkrm2	G G C C A G C C C T	G G G G T G G G A G A	T G G C A G G A T T	G G C C A T C T T T G	634
hkrm2	G G A C A G C C C T	G G G G T G G G A G A	T G G C A G G A T T	G G C C A T C T T T G	637
mkrm1	A C A C T C T C G T	G G G C C C C T G C	G G T G G G A A C T	A C T C A G C C A T	662
hkrm1	A C A C T C T C G T	G G G C C C C T G C	G G T G G G A A C T	A C T C A G C C A T	662
mkrm2	A A G T G T C T G T	G G G C C C C T G C	C A G G G A A A C T	G G T C G G C T C C	674
hkrm2	A A G T G T C T G T	G G G C C C C T G C	C A G G G A A A C T	G G A C A G C C C C	677
mkrm1	G G C A G C C G T G	G T G T A C T C C C	C T G A C T T T C C	T G A C A C C T A C	702
hkrm1	G T C T T C T G T G	G T G T A C T C C C	C T G A C T T T C C	T G A C A C C T A C	702
mkrm2	T C A A G G A G T C	A T C T A C T C C C	C G G A C T T T C C	G G A T G A G T A T	714
hkrm2	T C A G G G C G T C	A T C T A C T C C C	C G G A C T T T C C	G G A C G A G T A C	717
mkrm1	G C C A C T G G C A	G A G T C T G C T A	C T G G A C C A T C	C G G G T T C C A G	742
hkrm1	G C C A C T G G C A	G A G T C T G C T A	C T G G A C C A T C	C G G G T T C C C G	742
mkrm2	G G A C C A G A C C	G G A A C T G C A G	C T G G G T A T T G	G G C C A A G T G G	754
hkrm2	G G G C C G G A C C	G G A A C T G C A G	C T G G G C C C T G	G G C C C G C C A G	757
mkrm1	G A G C C T C T C G	C A T C C A T T T C	A A C T T C A C C C	T G T T T G A T A T	782
hkrm1	G G G C C T C C C A	C A T C C A C T T C	A G C T T C C C C C	T A T T T G A C A T	782
mkrm2	G G G C C T G T G C	T A G A A C T C	A C C T T C C C C C	T C T T T G A G T T	791
hkrm2	G G G C C G G C C	T G G A G G T C	A G C T T C C C C C	T C T T T G A G C T	794
mkrm1	C A G G G A C T C T	G C A G A C A T G G	T G G A G C T G C T	G G A C G G C T A C	822
hkrm1	C A G G G A C T C T	G C G G A C A T G G	T G G A G C T T C T	G G A G G C C T A C	822
mkrm2	G G C T G A T T C T	G G G A C C G G C G	T G G A G C T A C C	G G A C G G C T . .	824
hkrm2	G G C C G A C C C G	C G C G A C C G G G	T G G A G C T G C G	G G A C G G C G . .	832
mkrm1	A C C C A C C G C G	T C C T G G T C C G	G C T C A G T G G G	A G G A G C C G C C	862
hkrm1	A C C C A C C G T G	T C C T A G C C C G	C T T C C A C G G G	A G G A G C C G C C	862
mkrm2	C G T C C G G C A	A C C T A C T C C G	T G C C T T C G A C	G G C C C C C C C C	868
hkrm2	C T T C G G G C A	A C C T G C T C C G	C G C C T T C G A T	G G C C C C C G C C	871
mkrm1	C G C C T C T G T C	T T T C A A T G T C	T C T C T G G A T T	T G T C A T T T T	902
hkrm1	C A C C C C C T C C	C T T C A A C G T C	T C T C T G G A C T	T G G T C A T C C T	902
mkrm2	C G C C C C C C C C	G G G A C C G T G	C G C C T G C G C A	C T G C A T C C C T	908
hkrm2	C A C C C G C G T C	C G G G C C G C T G	C G C C T G G G C A	C T G C C G C C C T	911
mkrm1	G T A T T T C T T C	T C T G A T C G C A	T C A A T C A G G C	C C A G G G A T T T	942
hkrm1	G T A T T T C T T C	T C T G A T C G C A	T C A A T C A G G C	C C A G G G A T T T	942
mkrm2	G C T G C T C A C C	T T C C G C A G C G	A C G C A A G A G G	C C C A T G . . C T C	946
hkrm2	G C T G C T C A C C	T T C C G C A A G C	A C G C G C G C G G	C C A C G . . C G C	949
mkrm1	G C T G T G T T G T	A C C A A G C C A C	C A A G G A G G A A	C C G C C A C A G G	982
hkrm1	G C T G T T T T A T	A C C A A G C C C T	C A A G G A G A A A	C T G C C A C A G G	982
mkrm2	A A G G C T T T G C	G C C T C A C C T A C	C G C G G G C T G C	A G G C A T A C A G T	986
hkrm2	A A G G C T T T G C	G C C T C A C C T A C	C G C G G G C T G C	A G G A C G C C G C	989
mkrm1	A G A G A C C T G C	T G T C A A C C A G	A C C C T G G C A G	A G G T G A T C A C	1022
hkrm1	A G A G G C C C C C	T G T C A A C C A G	A C C C T G G C C G	A G G T G A T C A C	1022
mkrm2	G G A G G C C A G A	G C A T C T C C A G	A G G A T T . C A A	C T G A G A G T C T	1025
hkrm2	T G A G G A C C C A	G A G G C C C C C G	A G G C T . C G G	C C C A G A C C C C	1028
mkrm1	C G A G C A A G C C	A A C C T C A G T G	T C A G C G C T G C	C C A C T C C T C C	1062
hkrm1	G G A G C A G G C C	A A C C T C A G T G	T C A G C G C T G C	C C G G T C C T C C	1062
mkrm2	C G C A G G G G A C	C G C G A T G G G G	C T A A C G G G A G	C T G C A G C C C C	1065
hkrm2	C G C G G C G C C C	C T G G A C G G G G	C C A A C G T G A G	C T G C A G C C C C	1068
mkrm1	A A A G T C C T C T	A T G T C A T C A C	G C C C A G C C C C	A G C C A C C C C T	1102
hkrm1	A A A G T C C T C C	A T G T C A T C A C	C A C C A G C C C C	A G C C A C C C C A	1102
mkrm2	A A G . . . C C C T	G G A G C T G C A C	A G G C T T C G A T	A G G T G C C C C A	1101
hkrm2	A G G . . . C C C T	G G G G C T C C C C	C G G C C G C G A T	T G G G G C C C C G	1104
mkrm1	C G C A G A C T G C	C C C A G G T A G C	C A T T C C T G G G	C A C C G T C A G T	1142
hkrm1	C T C A G A C T G T	C C C A G G T A G C	A A T T C C C T G G	C C G C C C C A T	1142
mkrm2	G T C T T C T C C A	C C G G T G A C G G	C T T C C C T G T G	C T G C C T G C T G	1141
hkrm2	G T C T T C T C G A	C G G T G A C G G C	T G T C T G G T G G	C T G C T G C T G C	1144
mkrm1	T G G G G C C A A C	A G C C A C A G A G	T G G A A G G A T G	G A C T G T G T A C	1182
hkrm1	G G G G G C C T G G	A G C C A C A G A G	T T G A A G G A T G	G A C A G T C T A T	1182
mkrm2	T G C T C C C T G T	C C T A C T G C G T	T T G T T G C G T C	G A C G G . . .	1176
hkrm2	T G C T C C T G G G	G C T G C T G C G T	C G G C T G C G C C	G A C G G T G C G G	1184

Multiple-alignment of mouse and human kremen DNAs (3-2)

Fig. 1 b

3/7

```

mkrm1  G G C C T G G C G A   C C C T C C T C A T   C C T C A C A G T C   A C A G C A G T T G   1222
hkrm1  G G T C T G G C A A   C T C T C C T C A T   C C T C A C A G T C   A C A G C C A T T G   1222
mkrm2  G G C G C T G G G G   C A G G G C C T G A   G G G C G G A . C C   G G T G G A G C T G   1181
hkrm2  G G C G C T G G G G   C A G G G C C T G A   G G G C G G A . C C   G G T G G A G C T G   1223

mkrm1  T C G C A A A G A T   T C T T C T G C A T   G T C A G A T T T A   A A T C T C A T C G   1262
hkrm1  T A G C A A A G A T   A C T T C T G C A C   G T C A C A T T C A   A A T C C C A T C G   1262
mkrm2  T C T G C T G G G T   C C A G G A A A A G   G G T C T C T G G C   G A T G G G A C C T   1221
hkrm2  T C T G C T G G C T   C C G G G A A A A G   G G C C C C G G C   G C T G G G G G C T   1263

mkrm1  A G T C C C T G C A   T C A G G G A G A C C   T T A G G G A C T G   T C G T C A G C C T   1302
hkrm1  T G T T C C T G C T   T C A G G G G A C C   T T A G G G A T T G   T C A T C A A C C A   1302
mkrm2  T C C C G G G G C C   C C G G G A G A A G   C T G G G C T G T G   T G G T A C C G C C   1261
hkrm2  T C C A G G G G C C   C C A G G A G A A G   C T G G G C T G T G   T G G T A C C A A C   1303

mkrm1  G G G G C T T C T G   G A G A T A T C T G   G A C G A T T T T C   T A T G A A C C T T   1342
hkrm1  G G G A C T T C G G   G G G A A A T C T G   G A G C A T T T T T   T A C A A G C C T T   1342
mkrm2  G G C C C C G A G G   G G T G G G G C T G   C C C T G T C C C C   C A G G G G A C T C   1301
hkrm2  A G C C C C G A G G   G G T G G C C T T G   C C C T G C T C C C   C C G G G G A C C C   1343

mkrm1  C C A . . C T A C A   A T C T C C A T C T   T T A A G A A G A A   G C T C A A G G G T   1380
hkrm1  C C A . . C T T C A   A T T T C C A T C T   T T A A G A A G A A   A C T C A A G G G T   1380
mkrm2  T C A G G C T G A G   G G T G C T G C T G   C G G G C T A C C G   T C C C C T G A G T   1341
hkrm2  C C A G G C T G A G   G G T T C T G C C G   C G G G C T A C C G   G C C T C T G A G T   1383

mkrm1  C A G A G T C A A C   A A G A T G A C C G   C A A T C C C C T C   G T G A G T G A C T   1420
hkrm1  C A G A G T C A A C   A A G A T G A C C G   C A A T C C C C T T   G T G A G T G A C T   1420
mkrm2  G C C T C C A G C C   A G A G C T C C T T   G C G C T C G C T C   G T C T C T G C T C   1381
hkrm2  G C C T C C A G C C   A G A G C T C C C T   G C G C T C G C T C   A T C T C C G C T C   1423

mkrm1  G A - - -   1422
hkrm1  A A - - -   1422
mkrm2  T C T G A   1386
hkrm2  T C T G A   1428

```

Multiple-alignment of mouse and human kremen DNAs (3-3)

Fig. 1 c

4/7

```

mkrm1 1 MAPPAARLALLSAAALTTLAARPAPGPRS.GP...ECFTANGADYRGTSWTALQG
hkrml 1 MAPPAARLALLSAAALTTLAARPAPSPGL.GP...ECFTANGADYRGTONWTALQG
mkrm2 1 MCTPHLQGFLLLFPLLLR.LEGASAGSLHSPGLSECFQVNGADYRGHONYTGPGRG
hkrml 1 MCTPHLQGFLLLFPLLLR.LEGASAGSLHSPGLSECFQVNGADYRGHONRTGPGRG

mkrm1 52 .GKPCFLFWNETFOHPYNTLKYPNGEGLGEHNYCRNPDGDVSPWCYVAEHEDGVY
hkrml 52 .GKPCFLFWNETFOHPYNTLKYPNGEGLGEHNYCRNPDGDVSPWCYVAEHEDGVY
mkrm2 55 AGRPCFLFWDQTQOHSYSASDPQGRWGLGAHNF CRNPDGDVQPWYVAETEEGTY
hkrml 56 AGRPCFLFWDQTQOHSYSASDPHGRWGLGAHNF CRNPDGDVQPWYVAETEEGTY

mkrm1 106 WKYCEIPACOMPENLGCKYKDHGNPPPLTGTSTKTSNKLTIQTCLSFCSRQRFKFG
hkrml 106 WKYCEIPACOMPENLGCKYKDHGNPPPLTGTSTKTSNKLTIQTCLSFCSRQRFKFG
mkrm2 110 WRKYCDIPTCHMPGYLGCEVDSGAPPALSGPSGTSTKLTVOVCLRFMRMGKQLAG
hkrml 111 WRKYCDIPTCHMPGYLGCEVDSGAPPALSGPSGTSTKLTVOVCLRFMRMGKQLAG

mkrm1 161 MESGYACFCGNNPDYWKHGEAASTECNSTCFGDHTOPCGGDGRITLFDTLVGACG
hkrml 161 MESGYACFCGNNPDYWKHGEAASTECNSTCFGDHTOPCGGDGRITLFDTLVGACG
mkrm2 165 YEAGYACFCGSESDLAGRGPAPATDCDQICFGHPGOLCGGDGRITLFDTLVGACG
hkrml 166 YEAGYACFCGSESDLAGRGPAPATDCDQICFGHPGOLCGGDGRITLFDTLVGACG

mkrm1 216 GNYSSAMAAVVYSPDFPDYATGRVCYWTIRVPGASRTHFNFTLFDTRDSADMVEL
hkrml 216 GNYSSAMSSVVYSPDFPDYATGRVCYWTIRVPGASRTHFNFTLFDTRDSADMVEL
mkrm2 220 GNYSSAPQGVYISPDFFDEYQPDNCSWVLGQLGAV.LELTFRLFLADSRDRDEL
hkrml 221 GNYSSAPQGVYISPDFFDEYQPDNCSWVLGQLGAV.LELTFRLFLADSRDRDEL

mkrm1 271 LDGYTHRVLVRLSGRSRPP.LSFNVSLDFVILYFFSDRINQAQGFALVQATKEE
hkrml 271 LDGYTHRVLVRLSGRSRPP.LSFNVSLDFVILYFFSDRINQAQGFALVQATKEE
mkrm2 274 RDVSEGNLLRAFDGARPPPPGPLRGTAAALTLFRSDARGHAQGFALTVRGLQDT
hkrml 275 RDVSEGNLLRAFDGARPPPPGPLRGTAAALTLFRSDARGHAQGFALTVRGLQDT

mkrm1 325 PPOERPAVNQTLAEVITEQANLSVSAHSSKVLVYVITSPSPHPPQAPGSHSWAP
hkrml 325 PPOERPAVNQTLAEVITEQANLSVSAHSSKVLVYVITSPSPHPPQAPGSHSWAP
mkrm2 329 VE.....GRASPEDSTESLAGDPPGAN.....ASCSP.....KPG....AA
hkrml 330 AE.....DPEAPEGSAQTPAAPDGAN.....VSCSP.....RPG....AP

mkrm1 380 SVGANSHRVEGWTVYGLATLLLELTVTANVAKILLHVT.....FKSHRVPASG.
hkrml 380 PMGAGSHRVEGWTVYGLATLLLELTVTANVAKILLHVT.....FKSHRVPASG.
mkrm2 361 QASIGARVFSVTVAESVLLLLLSLRLRLRRS.....CLLAPGKGS
hkrml 362 PANIGARVFSVTVAESVLLLLLSLRLRLRRRCGATGQGLRADRWSCLLAPGKGP

mkrm1 427 .DLRDCHQPGASGDITTFYEPSTTISIFKKKLKGOSQ..QDDRNPLVSD~~~~~
hkrml 427 .DLRDCHQPGTSGEIWSIFYPSTTISIFKKKLKGOSQ..QDDRNPLVSD~~~~~
mkrm2 403 LAMGPSRGPPRS...WAVVYRRPRGVALPCPPGDSQAECPAAGYRPLSASSQSSSL
hkrml 417 PALGASRGPPRS...WAVVYQPPRGVALPCSPGDPQAECPAAGYRPLSASSQSSSL

mkrm1 474 ~~~~~~
hkrml 474 ~~~~~~
mkrm2 455 RSLVSAL
hkrml 469 RSLVSAL

```

Multiple-alignment of mouse and human Kremen proteins

Fig. 2

5/7

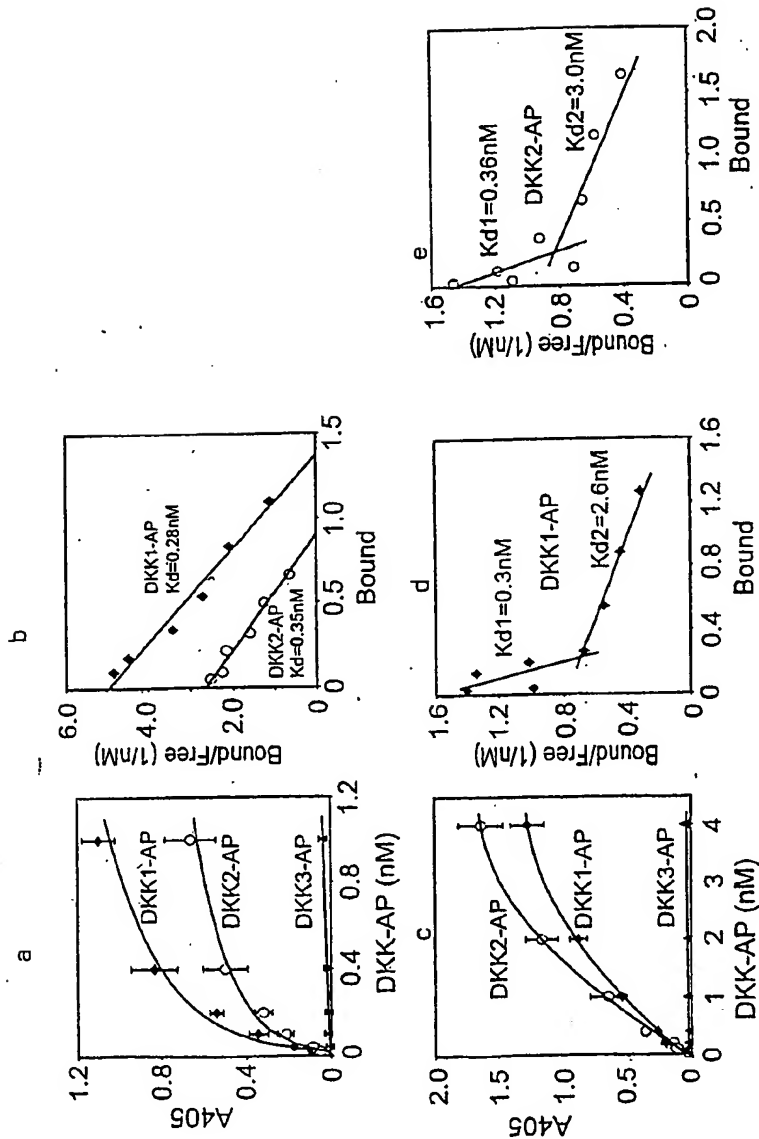


Fig. 3

6/7

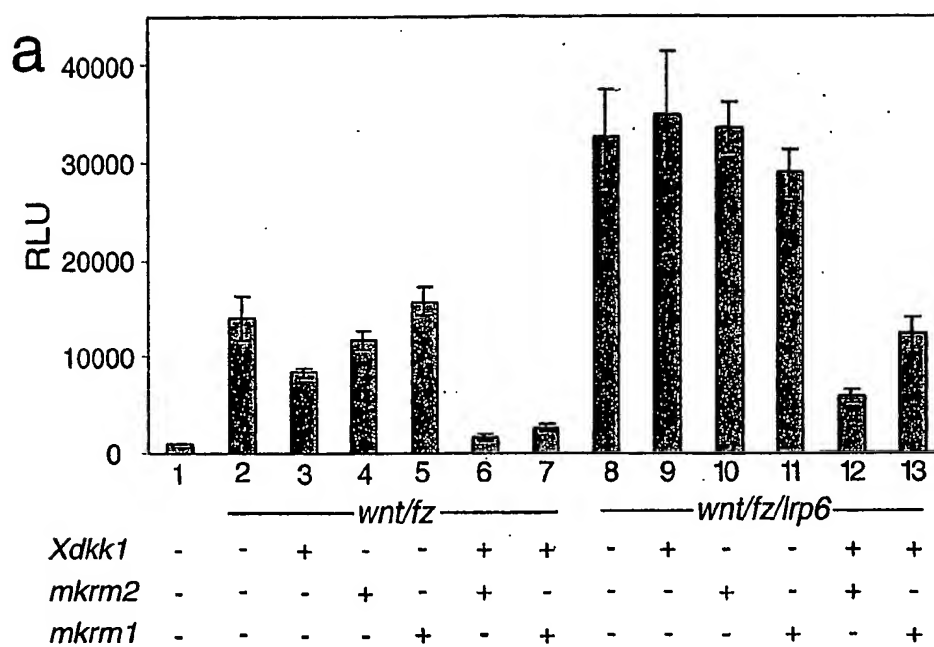


Fig. 4

7/7

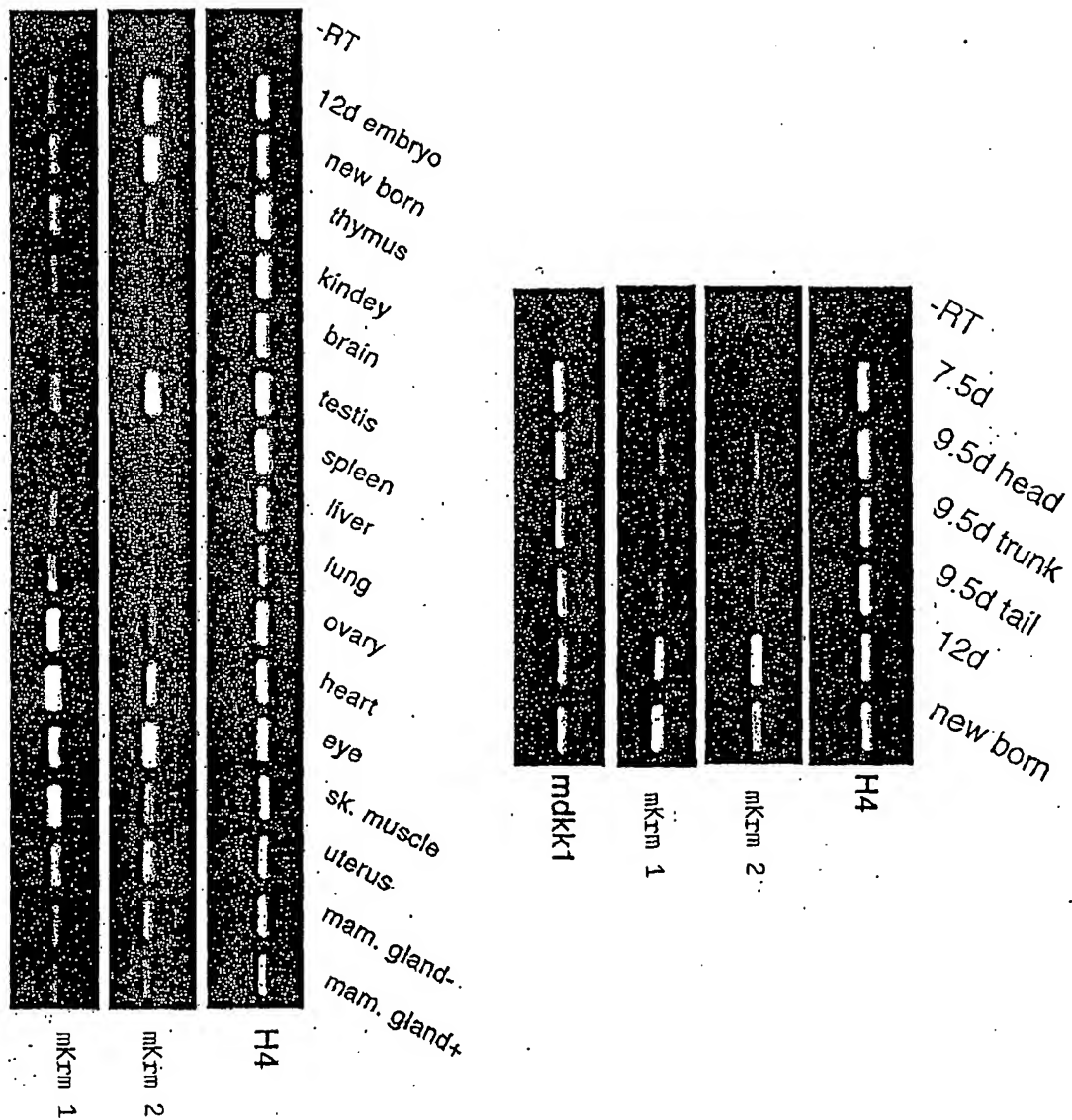


Fig. 5